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1. GAS INDUSTRY

Education

Joint Comm. Atomic Energy. SHORTAGE OF SCIENTIFIC AND ENGINEERING MANPOWER. 84th Congress: Hearings, Subcomm. Resch. and Devel. April 17-26, May (1956): Washington, G.P.O.; 487 pp.

Detailed statements of 36 government officials, educators and research leaders led off by Dr. W. F. Libby, Atomic Energy Commission, are given covering the six-day session on scientific manpower problems. Pertinent additional exhibits on 28 subjects, covering enrollments, degrees, training programs and school and government policies, are included. O. P. Brysch

National Science Foundn. FEDERAL SUPPORT FOR SCIENCE STUDENTS IN HIGHER EDUCATION 1954. NSF 56-18 (1956) Washington, G.P.O.; 33 pp.

This paper gives a factual presentation of present and past support in various phases of the college and graduate education program.
R. T. Ellington

Gas and Oil Future

Dressler, R. G. and Cruse, R. R. ENERGY RESOURCES—HOW THIN? *Chem. Eng.*, **63**, 173-76 (1956) July.

The United States has 15 years supply of petroleum, 22 years supply of natural gas and 4000 years supply of coal if present rates of usage are continued. However the consumption of energy will certainly increase. By the year 2000 nuclear energy is expected to provide 5 times the present annual consumption of energy.
W. G. Bair

Hedlund, C. J. A LONG RANGE LOOK-AHEAD FOR OIL AND NATURAL GAS. *J. Petrol. Techn.*, 8, 11-14 (1956) July.

The author reflects the opinion of the oil industry that the outlook for the future is excellent. In the nine post-war years, petroleum consumption in the U. S. has increased by 70 percent to 8.5 mill. bbl/day and marketed production of natural gas has more than doubled to over 9 trill CF/year. Projecting to 1975, it appears that the oil demand may increase 75 percent to 15 mill. bbl/day, and natural gas demand may double, to 18 tril. CF/year. Cumulative consumption thus would exceed present reserves, by over twice in oil and by 1½ times in the gas industry. The required fuel supplies will be found with continued rates of discovery (barring government interference) by improved techniques. Also imports of foreign oil, based on the 1954 ratio of domestic crude and heavy fuel oil production, should be revised to meet the growing fuel oil demand. Auxiliary fuel supplies from oil shale, tar sands and coal are not likely to be drawn upon, until competitive in price with oil. Atomic energy by 1975 may comprise half of new installed plants, or 11% of the U. S. electricity generated. Continued capital investment (8 billion worldwide 1955) in exploration, improved techniques in products, and shipping indicates wide expectations of future health and growth. O. P. Brysch

German Gas Supply

Raschig, M. SICHERUNG DER GASERZEUGUNG (SECURITY OF GAS SUPPLY) *Gas- und Wasserfach*, **97**, 541-49 (1956) July.
Rapid growth of gas demand for space heating has increased the winter peak loads in all cities of Germany. New methods of production have been developed to meet this demand, since the usual supply of coke oven and water gas could not be increased without severe economic problems. Equipment, flow sheets and operating data are briefly discussed for the new complete coal gasification processes, such as the Mailand generator (Dr. C. Otto & Co.) and the Lurgi pressure gasification (Steinkohlengas A.G.). Also oil gasification processes, using thermal and catalytic (ONIA-GEGI and SEGAS) are in use or under construction in 4 plants. Reforming of liquified petroleum gas is in operation at one plant (Coesfeld), and at locations where extra producer and water gas equipment is available, direct carburetion with LP-gas is practiced. O. P. Brysch

Middle East Oil

MIDDLE EASTERN OIL—WESTERN PROBLEM. *Chem. Eng. News*, 34, 5236-39 (1956) October 29.

Oil output of the Middle East going to U.K. and Western Europe is 63 percent of total production. This plus 9 percent more (72% total production) passes through Suez and the E.

Mediterranean pipelines. Effects of interference with this movement of petroleum are discussed, together with other pertinent statistics, and effects on U. S. supply. O. P. Brysch

Public Relations

Ginna, R. E. THE PUBLIC OWNERSHIP THREAT. *Gas Age*, 118, 35, 36, 38, 39, 71, 72, July 12 (1956).

The article states that the individual companies have served well for their respective communities, but the gas industry as a whole has failed to sell itself to the nation. The immediate objective is to concentrate in those areas where competition is possible and this includes: 1) efficiency of operation 2)technical know-how 3) service plus public relations. The latter is considered the most important one and all recognize the importance but few only develop their full potential. G. Kunst

Radioactive Toxicity

Libby, W. F. RADIOACTIVE FALLOUT AND RADIOACTIVE STRONTIUM. *Science*, 123, 657-60 (1956) April 20.

Each 20,000 ton TNT equivalent atomic bomb produces 2 lb. radioactive materials, consisting of some 90 active species, varying in lifetime from less than one second to several years. Radioactivity induced in air from nuclear explosions is due to C^{14} formation (half life of 5600 yr.) via the interaction of neutrons with atmospheric nitrogen. Cosmic rays have this same effect, i. e., liberation of neutrons which produce C^{14} from N_2. The total C^{14} content of the earth's surface, originating from cosmic radiation, is approximately 80 tons. This corresponds to the liberation of 5.2 tons of neutrons. One 20,000 ton TNT atomic bomb, consisting of the explosion of 1 kg. of U^{235} or Pu^{239} gives only 10 grams of neutrons. The naturally occurring total C^{14} content of the atmosphere corresponds to the release of 170 lb of neutrons. Thus 1000 megatons of nuclear fission would have to be released to double the present C^{14} content of the air and 66,000 megatons of fission to cause a doubling of the C^{14} content of earth's surface. The radioactive isotope of strontium (Sr^{90}) is probably the most physiologically toxic fission product released from nuclear weapons. The tolerance limit in a man per kg is 1 microcurie Sr^{90} activity. It is estimated that 11,000 megatons of nuclear fission would produce this activity level of Sr^{90}, if evenly distributed over the earth. C. G. von Fredersdorff

Work-Saving

GETTING THE BEST FROM EVERYONE'S JOB. *Petroleum Week*, 27-29 (1956) July.

Esso Research and Engineering Co. has saved an estimated one million dollars in the first year of its "work simplification" program. Its slogan, "Work smarter—not harder," has resulted in the development of a large number of money-saving techniques. While the program has been aimed principally at the non-professional employees, an extension is being applied to the engineering and scientific staff. The program and results obtained are outlined. B. E. Eakin

2. APPLIANCES

Air Conditioning

Kaufman, B. GRAPHICAL ANALYSIS FOR AIR CONDITIONING SYSTEM PERFORMANCE. *Refrig. Eng.*, 64, 52-57 (1956) July.

Here is a procedure by which a series of specific capacity determinations can be made and combined into a nomograph in which the unit capacity can be determined directly from a knowledge of the conditions affecting the components. The procedure can also be used to determine the effect a change in component capacity, or the inclusion of a back-pressure regulating valve will have on the system characteristics.

Author's Abstract

MacMahon, R. D. GAS AIR CONDITIONING BY PRECEPT. *Amer. Gas Assoc. Monthly*, 38, 10-11, 50 (1956) July-August.

The Southern California Gas Co. has installed two models of air conditioning in their general offices. The Servel and Carrier absorption systems provide the lowest weight load per ton of cooling of any available equipment. These units which are in operation 365 days a year offer the absence of vibration in their "no-moving parts" system. Another factor which was of great importance in choosing the proper systems in which both units excelled was minimum space.

G. Kunst

Straub, H. E., Gilman, S. F. and Konzo, S. DISTRIBUTION OF AIR WITHIN A ROOM FOR YEAR-ROUND AIR CONDITIONING PART I. University of Illinois, Eng. Exp. Sta. Bull. No. 435 (1956) July.

This bulletin is part of a research project involving the design and operation of a year-round air conditioning system. Air distributions from a number of types and classes of outlets installed in an experimental room are compared. Studies of each class of outlet showed the effects of flow rate and supply air velocity on the air distribution. Other studies compared the effects of return intake locations, length of outlets, mounting height of outlets, and some environmental conditions. It was found that no one type of outlet or combination of types gave optimum performance for both heating and cooling. An appendix describes the construction and operation of a heated thermocouple anemometer used in the testing. J. Weise

ALL-YEAR AIR CONDITIONING—IT MAY COST MORE TO LIVE WITHOUT IT. *Butane-Propane News*, **18**, 32-34 (1956) July.

Home air conditioning is much more than just improved comfort and more enjoyable living. Recent research shows very definite values in improved health and direct financial gains. Benefits of all-year air conditioning should be seriously considered since it may cost your domestic customers more to live without it than it would to buy it. Editor's Abstract

Appliance Safety

PLANT CONDUCTED TESTS INSURE SAFETY OF HEATING APPLIANCES. *Amer. Gas J.*, **183**, 18-19 (1956) August.

For quality control, the Reznor Manufacturing Co. uses a sensitive infrared gas analysing instrument to make sure that the carbon monoxide requirements for heating appliances are met. The LIRA-type infrared gas and liquid analyser produced by the Mine Safety Appliance Co. is a completely automatic device and makes a continuous rapid analysis for one component of a sample mixture. Due to the principle of operation, namely the infra-red adsorption spectra, very low gas concentrations may be detected. G. Kunst

Burners

Blaha, E. (assigned to Selas Corporation) GAS-FUELED RADIANT BURNER. U. S. 2,762,-428 (1956) September 11.

Cartter, W. G. OVERHEAD FUEL BURNING HEATERS. U. S. 2,759,472 (1956) August 21.

Crone, A. H. (assigned to Geo. D. Roper Corp.) TOP BURNER ASSEMBLY FOR GAS STOVE. U. S. 2,759,471 (1956) August 21.

Getz, D. L. and Hedges, R. O. (assigned to Kelsey-Hayes Wheel Co.) GAS BURNER. U. S. 2,759,533 (1956) August 21.

Knight, P. L. (assigned to Surface Combustion Corp.) BURNER APPARATUS. U. S. 2,764,145 (1956) September 25.

Munn, A. C. PILOT BURNER. U. S. 2,761,497 (1956) September 4.

Short, H. M. (assigned to Aluminum Co. of America) RADIANT TUBE GAS BURNER. U. S. 2,759,473 (1956) August 21.

Controls and Ignition

Dymski, D. A. (assigned to General Motors Corp.) BURNER SAFETY CONTROL SYSTEM. U. S. 2,761,625 (1956) September 4.

Eskin, S. G. (assigned to The Dole Valve Co.) COMBINATION OVER-TEMPERATURE SHUT-OFF AND FLAME SAFETY VALVE. U. S. 2,758,642 (1956) August 14.

Gruber, F. E. (assigned to Brown and Bigelow Corp.) GAS LIGHTER CONTROL UNIT. U. S. 2,764,008 (1956) September 25.

Hoff, J. M. and Mayer, C. M. (assigned to The Tappan Stove Co.) AUTOMATIC IGNITION AND CONTROL MECHANISM FOR GASEOUS FUEL BURNERS. U. S. 2,761,502 (1956) September 4.

Mueller, E. H. DOUBLE OUTLET VALVE FOR CONTROLLING GAS. U. S. 2,763,289 (1956) September 18.

Reedy, E. M. and Mueller, F. H. (assigned to Mueller Co.) PIPE STOPPER FITTING. U. S. 2,763,282 (1956) September 18.

Rice, H. W. and Derse, D. A. (assigned to Robertshaw-Fulton Controls Co.) ELECTRIC IGNITION DEVICE FOR GASEOUS FUEL. U. S. 2,761,947 (1956) September 4.

Wood, A. R. LIGHTERS FOR GAS BURNERS. U.S. 2,758,641 (1956) August 14.

Clothes Dryer

McCormic, F. H. (assigned to General Motors Corp.) DOMESTIC APPLIANCE. U. S. 2,752,694 (1956) July 3.

The object of this invention is to provide a clothes dryer of the rotating drum type with an electric heater in the air stream entering the drum at one end in a way to avoid interference with the loading and unloading of clothes through a door opening at the other end. By breaking the heated moisture-laden air stream by vanes into a plurality of smaller air streams and passing them through separate passage ways over the tubes of an air-cooled heat exchanger, moisture and lint is removed from the heated drying air leaving the cabinet in order to reduce the moisture content of the air discharged from the apparatus. G. Kunst

Cookers

Knapp, A. S. (assigned to Knapp-Monarch Co.) COMBINATION STOVE AND BROILER. U. S. 2,764,080 (1956) September 25.

Reeves, H. M. (assigned to Florence Stove Co.) GAS RANGE DRAWER STRUCTURE. U. S. 2,762,677 (1956) September 11.

German Appliances

Heidtkamp, G. ENTWICKLUNGSSTAND DER GASGERAETE. (DEVELOPMENT OF GAS APPLIANCES). *Gas- und Wasserfach*, (German) 97, 565-71 (1956) July.

A discussion of the development of gas appliances was presented by the gas appliance laboratory of the Gesag Berlin. The history of each is described and it was stated that gas ranges, space heaters, refrigerators and washing machines had attained satisfactory development. With the automatic safety, regulating and switching devices they have reached a remarkable level. For the solution of still unsolved problems, however, more detailed work and an effective cooperation of all members of the gas field is of primary importance. Illustrations of several of the individual devices, and their state of development are presented in detail.

G. Kunst

Incinerators

Short, G. A. and Shuler, M. GAS FIRED INCINERATORS. U. S. 2,752,870 (1956) July 3.

The invention relates to a domestic gas-fired incinerator, incorporating an after burner in the flue-pipe. The gas burner control system for the main burner and after burner included automatic pilots for lighting both the main burner and the after burner. In normal operation the control system will permit the after burner and its pilot to be relighted automatically by heat from the main combustion zone, if both the after burner and its pilot are extinguished either by abnormal operating conditions, or during idle periods.

A. M. Pelczarski

Space Heater

Patten, D. C. (assigned to J. V. Patten Co.) WARM AIR FURNACES. U. S. 2,757,661 (1956) August 7.

Water Heaters

Griffiths, J. C. and Pountney, C. H., Jr. THE APPLICATION OF HEAT TO DOMESTIC GAS STORAGE WATER HEATERS. Amer. Gas Assoc. Lab. Res. Bull. 71, Project DA-2WH (1956).

An analysis of the water heating process produces findings which points the way toward a) improving recovery performance of domestic gas water heaters without seriously increasing size or cost and minimizing service difficulties. Effects of burner design and placement, combustion chamber baffle configuration, and flueway exit and secondary air inlet area restrictions on recovery efficiency and heat transfer are evaluated. The feasibility of increasing heat transfer through the vertical flueway while decreasing the amount of heat through the bottom of the tank is demonstrated, resulting in several possibilities for new water heater designs.

G. Kunst

Bruemmerhoff, W. (assigned to Johann Vaillant Kommanditgesellschaft) GAS-FIRED WATER HEATER. U. S. 2,763,244 (1956) September 18.

3. COMBUSTION AND INDUSTRIAL FURNACES

Combustion Catalyst

Grimes, W. W. (assigned to S O Co.), OXIDATION OF WASTE GASES. U. S. 2,756,121 (1956) July 24.

A waste gas containing carbon monoxide and high boiling hydrocarbons (from a "coked" catalyst burn-off) is oxidized over a platinum catalyst, in a process which claims improved life of catalyst by recycling part of the hot "oxidized" gases to raise the inlet gases, air, and catalyst to 700°F. O. P. Brysch

Enamelling Furnaces

THE USE OF GAS IN VITREOUS ENAMELLING. *Indust. Finishing* (British), 9, 676-685 (1956) July.

This article describes the uses of gas in the four main divisions of vitreous enameling: enamel frit production; metal preparation; base coat application and treatment; enamel cover coat and treatment. A semi-mechanized plant uses gas-fired furnaces for smelting grit and to heat steam for the enamel treating processes. A process using a gas flame replaces the chemical pickling process of cleaning metal.

V. E. Sater

THE ROLE OF OXYGEN IN IRON-ENAMEL ADHERENCE. *Ceramics* (British), 8, 118-9 (1956) July.

A description of the adherence mechanism in enamelling, giving the results of a series of experiments in which the oxygen content of the furnace was varied when the same enamel containing varying amounts of an adherence promoter was fired on to iron. Authors' Abstract

High Temperatures

PUTTING ON THE HEAT. *Chem. Eng. News*, 34, 3442-45 (1956) July 16.

The attainment of high temperatures by oxidation reactions is discussed. An oxyaluminum torch capable of operation at 3800° K, is receiving commercial consideration. Still higher temperatures are possible through the reactions with oxygen of beryllium (4300° K) cyanogen (4800° K) and higher nitrides of carbon. The highest experimentally attained flame temperature is in the combustion of carbon subnitride (C_4N_2) which produces a temperature of 5300° K at one atmosphere. S. A. Weil

Metallurgical Heating

Trinks, W. EXPERIENCES IN THE HEATING OF STEEL. *Ind. Heating*, 23, 1221-2, 1224, 1226 (1956) June.

A brief summary is presented of recent work on critical heating rates for various steels and the interrelation of steel properties such as thermal conductivity, ductility and tensile strength, size of heating stock and method of heat applications. The need for further work in this field is emphasized. R. T. Ellington

WATCH MANUFACTURER DEVELOPS NEW HEAT TREATING TECHNIQUE. *Gas Age*, 18-20, 56 (1956) August 23.

Hamilton Watch Co.'s new process gives bright finish, distortion-free results on minute pieces going into instruments and aircraft, as well as into watches. It allows such manufacturers to finish machine parts before heat treating.

Authors' Abstract

Multiple Fuels

Buna, T. COMBUSTION CALCULATIONS FOR MULTIPLE FUELS. *Amer. Soc. Mech. Eng. Trans.*, 78, 1237-49 (1956) August.

The paper presents correlations designed to assist calculation of performance tests of steam boilers fired simultaneously with a multiplicity of fuels. The special difficulties involved in obtaining reliable fuel-flow data and the propagation of uncertainties in the basic quantities defining alternate efficiencies are discussed. This is one of the few publications discussing the problem involved with multiple fuels and the material seems to point the way towards increased efficiencies in boiler firing.

D. A. Worcester

Nuclear Power

Keagy, W. R., Jr. FUTURE PROSPECTS FOR NUCLEAR POWER. *Battelle Techn. Rev.*, 5, 3-9, July (1956).

A discussion of the present and possible future status of both nuclear power and military propulsion reactors is presented. Competitive nuclear power in central stations is estimated to be 15 years away. D. V. Kniebes

Stoughton, L. D. and Sheehan, T. V. THE LIQUID-METAL-FUEL REACTOR CLOSED-CYCLE GAS-TURBINE POWER PLANT. *Mech. Eng.*, 78, 699-702 (1956) August.

There is considerable interest in the U.S.A. and in Europe in the advantages of a closed-cycle gas-turbine power plant operating on a liquid-metal fueled nuclear reactor. The proposed fuel consists of uranium dissolved in molten bismuth, and the generated heat is exchanged with the gas-turbine inert working fluid (nitrogen or helium) through either an external or an internal heat transfer system. Because of the high melting point (520° F.), and high boiling point of bismuth (2691° F.) at atmospheric pressure, inlet turbine temperatures above 1200° F. are feasible, resulting in overall thermodynamic efficiencies in excess of 30% in the conversion of nuclear energy to electric power. Other advantages of the uranium-bismuth reactor are 1) negligible radiation damage to the fuel 2) low pressure of the nuclear reactor 3) continuous addition of new fuel and continuous removal and processing of spent fuel 4) no lower limit on fuel burn-up 5) low fuel inventory and 6) no control mechanisms required because the system is self-regulating. Current work on the liquid-metal-fueled nuclear reactor is being done at the Brookhaven National Laboratory. Esher Wyss is designing a 15,000 KW rated reactor with either nitrogen or helium as the gas turbine working fluid. The Gas and Electric Department of Holyoke, Mass., has recently proposed a 15,000 KW closed-cycle gas turbine plant as part of the Power Reactor Demonstration Program of the AEC. Other proposals, by nine different concerns, to the Maritime Commission have dealt with nuclear-powered gas turbine units for propulsion on merchant vessels. C. G. von Fredersdorff

Panel Heating

Schutrum, L. F. and Min, T. C. COLD WALL EFFECTS IN A CEILING-PANEL-HEATED ROOM. *Heatg, Pipg, Air Condg.*, 28, 125-132 (1956) August.

The room-side temperature of a wall or all-glass wall exposed to winter outdoor conditions affects the air temperature, the air movement and radiant conditions within the room. In a test room heated by a ceiling panel one whole wall was cooled to simulate the inside temperature of an exposed wall. Room-air temperatures, air velocities and mean radiant temperatures were measured under steady state conditions. On the basis of the tests following conclusions were made: 1) Variations in room-air temperatures were small: 2) Room-air velocities were negligible except near the floor: 3) Mean radiant temperatures were in general higher than the room-air temperature. G. Kunst

4. CARBONIZATION AND GASIFICATION

Carbonization

Eddinger, R. T. and Mitchell, J. PILOT-SCALE COKE OVENS: DEVELOPMENT AND OPERATION. *Ind. Heating*, 23, 1440, 1442 (1956) July.

Test results of a pilot coke oven of the Illinois slot-type were presented in detail at the AIME Blast Furnace, Coke Oven and Raw Materials Conf., April 9-11 (1956). Designed primarily for a study of coal blends and coke quality by Eastern Gas and Fuel Associates, the oven walls are built up of silicon carbide tile, and heated by 12 Globar resistance elements individually controlled. Coking time, coke quality tests, and relationship to plant-scale oven results are discussed. O. P. Brysch

COMING: MEDIUM-TEMPERATURE CARBONIZATION. *Chem. Eng.*, 63, 138, 140 (1956) July.

A commercial plant will be built soon in Montana to convert subbituminous coal by carbonization at 1100° to 1400°F to a low-volatile, soft char suitable for sponge-iron and lead smelting. The 320 ton/day plant will produce 150 tons/day of char plus accompanying creosote and coal tar. The vertical, annular retort is fed from above, and coal passes continuously downward with retention times about 15 to 30 minutes. The inner wall of the annulus rotates slowly to provide agitation to the coal which is crushed to 1½ inch. E. B. Shultz, Jr.

COS Removal

Oakley, H. T. (assigned to Esso Research and Engineering Co.) PROCESS FOR REMOVING

CARBONYL SULFIDE FROM GASES. U. S. 2,758,005 (1956) August 7.

Carbonyl sulfide is removed from hydrocarbon gases by treatment with aquerous alkali metal hydroxide at temperatures between 70 and 150° C. D. M. Mason

Cyclone Firing

DEVELOPMENT AND PRACTICE OF CYCLONE FIRING. *Fuel Efficiency*, 37, 540-44, (1956) July.

Cyclone furnaces for boiler heating which utilize pulverized coal have been used in commercial installation in the United States since 1944. Chief advantages of cyclone firing are increased boiler efficiency, the ability to retain in the furnace up to 85 percent of the ash as slag, and the utilization of lower grade coals. Heat releases are generally in excess of 500,000 Btu per cu. ft. per hour with gas temperatures above 3000° F. The low fly-ash content of the gases offers possibilities for direct utilization of the gases for powering gas turbines. Britain has done considerable experimental work recently with cyclone firing and is scheduling its first commercial installation. E. J. Pyrcioch

Dust Removal

Chamberlin, R. L. and Hedberg, C. W. J. (assigned to Research Corp., New York) ELECTROSTATIC GAS CLEANING METHOD. U. S. 2,756,842 (1956) July 31.

This invention relates to new methods for separating water particles from a gas stream containing suspended material and a subsequent treatment of the water depleted gas stream in an electrostatic precipitator and more particularly to such methods for the treatment of fume escaping from metal scarfing operations. Dry fume collection could be obtained satisfactorily in an electrostatic precipitator by mechanically eliminating substantial portions of the entrained water particles prior to electrostatic treatment. A further object of the present invention is provide methods for treatment of gases which are simple in operation, highly efficient and inexpensive. G. Kunst

BLOW GAS DUST FROM C. W. G. PLANTS. *Gas Times* (British), 88, 94 (1956) July 20.

Performance and design data are given for a dust collector installed in the main stack of a 2.5 MMCF per day water-gas plant. The collector consists of a series of two cyclones with a quantitative dust removal efficiency of 83.3 percent. Dust in the cleaned gas was found to be 0.086 gr/CF of which 0.075 gr is above 20 micron size. The recovered dust can be used for steam-raising and for blending with coal for carbonization. E. J. Pyrcioch

Gas Making Coals

Myhill, A. R. THE PREPARATION AND USE OF LOWER-RANK COALS FOR GAS-MAKING. *Coke and Gas* (British), 18, 316-18 (1956) August.

With the decrease in the reserves of choice British gas coals of groups 400 to 500, it is necessary to extend the range of gas making coals by blending higher volatile (500 to 902 groups) coals, or adding substances which supply an agglutinant. Both coke oven and gas retort practice must be considered, as the "two-fuel" industry is assumed. Advantages such as preventing expansion, improving heat penetration, improving vertical retort operation and controlling coke properties are weighed against cost of crushing and mixing, and reduced yield and quality of gas. Research on coal plasticity and on various additives, with continued emphasis on fundamental phenomena of coking, is outlined. O. P. Brysch

Gas Purification

Polderman, L. D. and Steele, A. B. WHY DIETHANOLAMINE BREAKS DOWN IN GAS-TREATING SERVICE. *Oil Gas J.*, 54, 206, 209, 212, 214 (1956) July 30.

The capacity of diethanolamine solutions to accept acid gases declines with use in some plants, particularly those in which organic acids, hydrogen cyanide, and carbon dioxide are components of the gas stream being treated. Such reductions have been traced, in part, to the accumulation of heat-stable diethanolamine salts of certain organic acids, such as formic and acetic, and of complex inorganic acids such as hydroferrocyanic acid. Conversion of diethanolamine to linear polycarbamides further

reduces the capacity of the scrubber fluid. In some plants the conversion of diethanolamine to N,N′-di(2-hydroxethyl) piperazine may represent a decided loss. The substituted piperazine is capable of salt forming with carbon dioxide, hydrogen sulfide, and other acid gases. Very little loss of acid gas acceptor capacity results even though significant amounts of diethanolamine are converted to the piperazine derivative. Data presented here demonstrate the advisability of revivifying with diethanolamine solutions at the lowest temperature commensurate with satisfactory acid-gas removal and general-plant performance, in order to reduce polycarbamide formation. D. M. Mason

Lindstrom, R. H. BURNT OXIDE IN PURIFICATION. *Nat. Gas Bull. (Australia)*, **20**, 38-42 (1956) June.

Results of laboratory and plant scale use of burnt iron oxide for purification are reported. Substantial improvement of purification with more efficient removal of H_2S, longer working life of oxide charge, and reduction of back pressure was noted. D. M. Mason

Wainwright, H. W., Kane, L. J., Wilson, M. W., Shale, C. C. and Ratway, J. PURIFICATION OF SYNTHESIS GAS. *Ind. Eng. Chem.*, **48**, 1123-33 (1956) July.

Results from investigations dealing with the purification of synthesis gas for use in the Fischer-Tropsch process are reviewed. Hydrogen sulfide, oxygen, dust, carbon dioxide, and carbonyl sulfide are the impurities present in raw synthesis gas produced at Morgantown, W. Va., by reacting coal with oxygen and steam. Research work has been conducted on the variables affecting the concentrations of these impurities in raw synthesis gas and the development of accurate and rapid analytical methods for determining their presence in low concentrations in purified gas. Results from laboratory, pilot plant, and plant scale experiments are reported on removing these impurities to the extent that the purified synthesis gas meets the specifications set up for the Fischer-Tropsch synthesis. Authors' Abstract

European Gas

Orlicek, A. F. THE PREPARATION OF GASEOUS FUELS. *Gas J.*, (British) 287, 37, 40-42, 45 (1956) July 4.

A general review of European gas producing practices is given. Methods to replace the base-load coke oven gas are being given more serious thought. Large scale conversion of blast furnace gas is being considered for a fuel gas source and also to produce higher boiling hydrocarbons. W. G. Bair

Lurgi Gasification

Andrews, R. S. BROWN COAL—PRESSURE GASIFICATION FOR TOWN GAS PRODUCTION IN VICTORIA: Barrow, G. E. BROWN COAL—CONSTRUCTION OF HIGH-PRESSURE GAS PIPELINE IN VICTORIA. *Gas J.* (British), 287, 346-8 (1956) August 8.

Australia's brown coal gasification plant located in Victoria at the Morwell brown coal fields is nearing completion and will be operating near the end of 1956. Initial output of town gas in the six Lurgi generators operating at 450 psig pressure will be 15 MMCF per day. Output will be increased to 60 MMCF per day by 1965 when the plant is enlarged. Future plans call for using a part of the gas for synthetic liquid fuel production by Fischer-Tropsch synthesis. An 18-in. diam. high pressure pipeline will transport the gas from the plant at Morwell to West Melbourne for a distance of 103 miles. The line will operate at pressures up to 400 psi for the first 80 miles and at 100 psi for the remainder of the distance. The pipe, in 30-ft lengths, is welded by an automatic arc welding machine. At the factory the pipe is coated with a $\frac{3}{32}$ in. thickness of plasticised coal tar enamel which is fibre-glass impregnated, followed by a second layer of enamel $\frac{3}{32}$ in. thick and a final wrap of tar impregnated asbestos. Three rectifier units will be used to provide cathodic protection. The pipeline is being laid in a trench 4 ft. 6 in. in depth. E. J. Pyrcioch

Fletcher, H. B. AUSTRALIA GASIFIES ITS BROWN COAL. *Gas*, **32**, 52-55 (1956) July.

A plant for the production of coal gas from Australian brown coal using the Lurgi process, erected at Morwell, Victoria and scheduled for initial operation in June 1956, will supply Melbourne with pipeline gas. The gas will be produced in six generators at a pressure of 400 psig by gasification of the coal with oxygen and steam with an initial output of 15 MMCF/day and will be blended with waste oil refinery gas before distribution. Major by-products recov-

ered will be tar and benzene. The crude benzene will be refined to produce gasoline. Cost of the plant is given as $18 million and the expected production by 1975 is 120 MMCF/day.

E. J. Pyrcioch

Reforming Processes

Arnold, J. H. (assigned to Hydrocarbon Research, Inc.) PRODUCTION OF SYNTHESIS GAS. U. S. 2,752,232 (1956) June 26.

The patent describes a method for introducing fuel gas and oxygen into a reaction zone for the generation of carbon monoxide and hydrogen. An annulus burner is employed with fuel gas supplied through a central conduit, oxygen through the annulus between the central conduit and a surrounding concentric conduit, and recycle product gas through the annulus between the oxygen conduit and a third concentric conduit.

E. J. Pyrcioch

Bond, G. R., Jr. and Oblad, A. G. (assigned to Houdry Process Corp.) PRODUCTION OF SYNTHESIS GAS. U. S. 2,754,187 (1956) July 10.

Normally gaseous hydrocarbons are contacted with alkali metal carbonates at temperatures in the range 1400-2000°F to produce yields of synthesis gas.

H. A. Dirksen

Solvent Extraction

Kroeger, C. DIE STEINKOHLEEXTRACTION: II: EINFLUSS DES LOESUNGSMITTELS, DES INKOHLUNGSGRADES UND DER TEMPERATUR AUF DIE EXTRAKTION. (COAL EXTRACTION: THE INFLUENCE OF THE SOLVENT, THE DEGREE OF CARBONIZATION AND THE TEMPERATURE ON THE EXTRACTION.) *Erdoel u Kohle*, 9, 516-20 (1956) August.

Numerous solvents have been tested for the influence on the extraction. A quantitative comparison of them could not be made, but qualitative comparisons concerning their effect is given by classifying the different solvents. The advantage and application of each group is presented. Also a study of the degree of carbonization of the coal and the extraction of preheated coal, as well as the temperature dependence and speed of reaction is discussed in detail.

G. Kunst

Sulfur Recovery

Pearce, F. G. (assigned to Stanolind Oil and Gas Co.) PROCESS FOR SULFUR RECOVERY. U. S. 2,758,913 (1956) August 14.

An improved process for conversion of H_2S to free sulfur is described in which the H_2S-rich gas is mixed with air, preheated to a temperature from 300 to 500° F., and passed over a catalyst. Temperature within the catalyst bed must be sufficiently high that the sulfur is vaporized from the catalyst as it forms. Gas velocities from about 1000 to about 15000 vols. (STP)/hr/vol. of catalyst are preferred. With feed gases containing about 10% of H_2S, overall conversions of 70 to 80% are obtained with selectivity to free sulfur ranging from 92 to 98%. With feed gases richer in H_2S it is desirable to conduct the conversion in two stages with intercooling in order to control the temperature.

D. M. Mason

Solar Coking

Olsen, R. B. SOLAR ENERGY COKING APPARATUS. U. S. 2,760,920 (1956) August 28.

A solar-heated coking furnace is claimed, consisting of a heat absorbing chamber mounted axially at the focal point of a parabolic reflecting surface composed of a plurality of flat mirrors, said chamber fed with coal and steam (and emptied of coke and gas) by conveyors and conduits in the columnar mounting.

O. P. Brysch

Water Gas

Rowan, D. M. PRODUCTION AND UTILISATION OF CARBURETTED WATER GAS USING LOW GRADE SOUTH AFRICAN COAL. *Gas World* (British) 144, 96-98 (1956) July 14.

This plant at Springs, Transvaal, South Africa, which began operation in February 1953, consists of two 1 MMCF per day units producing a 400 Btu gas. The water-jacketed gas generators have an internal diameter of 6 ft. with a steam boiler in the lower section. The carburetors are chequerless with gas flowing downward and countercurrent to the oil spray. Of the several coals tested in the plant, Kendal coal was shown to be best. This coal has a fixed carbon content of 48.30 percent and an ash content of 16.9 percent. Blue water gas produced from the Kendal coal has a heating value of 320 Btu. Ferrous hydroxide is used in the purifier to remove sulfur compounds from the raw gas.

E. J. Pyrcioch

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Compression

Alderson, W. T. SELECTION OF A COMPRESSOR. *Chem. Eng.*, 63, 188-201 (1956) June.
The factors bearing on selection of compressor type are discussed with emphasis on the economic aspects. The position is taken that reciprocating and centrifugal compressors are complementary rather than competitive.
R. F. Bukacek

Case, E. L. RECIPROCATING COMPRESSORS. *Chem. Eng.*, 63, 216-23 (1956) June.
A general discussion of reciprocating compressors in various applications with some of their operating characteristics. R. F. Bukacek

Damewood, G. TAKE THE PULSE OF COMPRESSOR PIPING. *Pipe Line Ind.*, 5, 30-33 (1956) July.
A brief description of the electric-acoustrial analog developed by the Southern Gas Association and Southwest Research Institute to study and evaluate compressor station piping systems.
R. F. Bukacek

Des Jardins, P. R. HANDLING COMPRESSIBLE FLUIDS IN CHEMICAL PROCESSING. *Chem. Eng.*, 63, 178-87 (1956) June.
A survey of compressor applications in the chemical process industries. A short section on trends in compression is included.
R. F. Bukacek

Joseph, J. NEW COMPRESSOR STATION INCREASES DELIVERY TO SAN DIEGO UTILITY. *Gas*, 32, 132-4 (1956) June.
The physical layout, equipment, operating conditions, and special features of a new one-operator compressor station are described and illustrated. This station contains two 1100-hp engine compressor units which will operate at 450 psig suction pressure and a 650 psig discharge pressure, and will increase the capacity of a 16-inch transmission line by 29 MMCF/day.
G. G. Wilson

Leonard, E. S. CENTRIFUGAL COMPRESSORS. *Chem. Eng.*, 63, 206-11 (1956) June.
The principles of operation, general characteristics, design, considerations, and installation problems of centrifugal compressors are briefly discussed. R. F. Bukacek

FIRST AUTOMATIC COMPRESSOR STATION. *Petrol. Eng.*, 28, D16-21 (1956) August.
This article describes Gulf Interstate Stanton Compressor Station, which is operated relatively unattended. R. F. Bukacek

Cycling

Resen, L. IMPROVING CYCLING-PLANT OPERATIONS. *Oil Gas J.*, 54, 140-141 (1956) June.
La Gloria Oil and Gas Co's. Falfurrias, Texas, cycling plant is continuously being modified for improved operation. Recent modifications include: 1) an automatic sales line sampler, 2) a continuous cooling-tower blowdown system, 3) installation of an expanding gas turbine to utilize residue-gas pressure, and 4) the application of corrosion-resistant coatings. The operation and results obtained for each of these improvements are discussed. B. E. Eakin

Exploration

Gussow, W. C. MIGRATION OF OIL. *World Oil*, 143, 79-83 (1956) August 1.
The author offers basic theories as to the probable mechanisms involved in the migrations and accumulations of gas and oil. These theories are presented as a possible aid in the location of oil and gas through geophysical studies. Previous work on compaction displacement by Hedberg and the effects of capillary displacement pressures by Hubbert are applied to primary migration. An application of the concept of drainage patterns in secondary migration is shown specifically on the Sweetgrass Arch in Montana. R. M. Wellek

Murdoch, E. J. SOUTH ARKANSAS SEES ROSY FUTURE. *Oil Gas J.* 54, 174, 175, 177 (1956) June.
The last few years have seen an accelerated drilling activity in Arkansas, increasing from a total of 307 wells in 1948 to 754 wells in 1955, or over 145%. The possibilities of the various productive formations are discussed. Wildcatting will probably be confined to known trends of regional faulting, while development and extension drilling in and on the flanks of present fields should continue to add new and profitable reserves to Southern Arkansas. B. E. Eakin

Gas Service Design

Hunt, B. E., Erwin, J. H., Libby, H. T. GAS SERVICE DESIGN. *Amer. Gas J.*, 183, 12-17 (1956) July.

This report is a review of present practices in the design and construction of gas services. No attempt has been made to draw conclusions as to the best design for a particular situation, but the information and illustrations should help, by indicating the degree of acceptance of various practices within the industry. The report confines itself to the design of residential and small commercial services, eliminating discussion of industrial gas services or industrial meter installations. The numerous tables and illustrations included were developed from replies to a questionnaire sent to representative gas companies. We have attempted to tabulate the data gleaned from these questionnaires and to include those illustrations which will be of most interest. Authors' Abstract

Leak Sealing

Barthel, D. E. INTERNAL AND EXTERNAL SEALING METHODS. *Gas Age*, 117, 30-33, 52 (1956) June 14.

The experience with a device for locating and coating leaking bell-joints internally with a rubberlike sealant is described. In order to use this device an 8-foot section of pipe must be removed every 600 feet. Successful use of the device in 8, 10, 12 and 16-inch pipe is claimed. Experience with the external application of liquid polysulfide polymers to leaking bell-joints is also briefly summarized. G. G. Wilson

LP-Gas Storage

Wissmiller, I. L. (assigned to Chicago Bridge and Iron Co.) METHOD OF COOLING AND STORING PROPANE AND THE LIKE. U. S. 2,753,691 (1956) July.

This invention relates to a system and method for storing LP-gas, and particularly concerns the cooling for storing of large batches of propane in pressure vessels. R. F. Bukacek

LP-Gas Transport

Turner, C. C. HOW AND WHY OF LP-GAS TRANSPORTATION. *LP-Gas*, 16, 33-43 (1956) July.

The article stresses cost analysis of transportation methods and gives examples of obtaining cost figures on operating tanks. Propan dispatching and scheduling are also covered.

W. G. Bair

Liquid Methane

Morrison, W. L. (assigned to Constock Liquid Methane Corporation) METHOD FOR USING NATURAL GAS. U. S. 2,753,700 (1956) July 10.

This patent relates to a technique for recovering mechanical energy and refrigeration from the expansion of natural gas from a high wellhead pressure to a low utilization pressure.

B. E. Eakin

Offshore Operations

Green, J. E. and List, H. H. THE DESIGN AND CONSTRUCTION OF UNDERWATER PIPELINES. Proc. Fourth World Petroleum Cong., Sec. VIII, 95-114 (VIII B, Paper 3), Rome, (1955) June.

Three major methods of laying underwater pipelines have been developed. In the first three sections of the paper the methods are reviewed, and the Lake Maracaibo crossing (Venezuela), Coro crossing (Venezuela), and Straits of Mackinac crossing (United States) are discussed in detail. The methods employed in laying each of these lines differed radically and were determined after giving proper consideration to the maximum depth of water, necessity of maintaining marine traffic, velocity and direction of wind, size of waves, velocity and direction of water currents, incidence and severity of storms, bottom conditions, equipment available, and probable least cost. The fourth section discusses trenching and backfilling for underwater pipelines. Authors' Abstract

Reed, P. and Deering, R. G. T. G. T.'s "MUSKRAT LINE": IT'S 80 PER CENT SUBMARINE—AND HERE'S HOW THE PIPE LAYING IS BEING DONE. *Oil Gas J.*, 54, 170-73 (1956) June 18.

Equipment and methods developed by Williams Brothers for efficient laying of large-diameter pipe from a barge are described and illustrated with pictures taken on T. G. T.'s "Muskrat" project. A step-by-step description of the barge laying operation is included. G. G. Wilson

Pipeline Cleaning

Olson, A. S. SOUTHERN CALIFORNIA GAS DETERGES A MOUNTAIN PIPELINE. *Gas*, 32, 125-9 (1956) June.

The equipment and operating procedures used to internally clean a nine-mile section of 14-inch pipe located at elevations of 1700 to 4500 feet is described. The equipment used included an inflated ball and chain crawler, a Williamson UG-pipeline pig, and a specially constructed pig stopper fitted with an air control line. The detergent used was *Oakite* No. 21. The calculated efficiency was improved from 71% to 92% at a cost of $650 per mile. G. G. Wilson

Pipeline Flow

Resen, L. HOW TO MAKE PIPELINE-FLOW-EFFICIENCY TESTS. *Oil Gas J.*, 54, 127, 128, 130, July 2 (1956).

A report on one of the sessions on Pipeline flow efficiency testing at the eleventh annual Short Course in Gas Technology held at Texas A and I College. The displacement method using ammonia, instruments, corrections and calculations are discussed. R. F. Bukacek

Radiation Logging

Atkins, E. R., Jr. RADIATION LOGGING: WHAT IT IS AND WHAT IT CAN DO FOR YOU. *Oil Gas J.*, 54, 88-93 (1956) July 16.

The physical principles of radiation logging are outlined and the effect of variations in hole diameter, formations, and formation fluids on radioactivity logs are discussed. B. E. Eakin

Remote Control

Ruth, D. K. TELEMETERING AND REMOTE CONTROL FOR SMALL SYSTEMS. *Gas Age*, 118, 30-33 (1956) July.

The telemetering system devised for remotely indicating gas pressures at eight locations and remotely controlling six regulator stations is outlined. G. G. Wilson

Texas Proration

Cameron, J. S., Jr. HOW TEXAS PRORATES GAS PRODUCTION. *Oil Gas J.*, 54, 242, 244, 247 (1956) June 18.

The senior engineer in charge of the Gas Department of the Railroad Commission of Texas describes in detail the methods of proration used in Texas. R. F. Bukacek

Waste Treatment

Smith, A. G. RIDDING PROCESS WATERS OF CAUSTIC SOLUTIONS AND SULFIDES. *Oil Gas J.*, 54, 95-6, 98-9 (1956) July 9.

An air-oxidation process has been developed which makes possible the disposal of sulfide-bearing waters without objectionable pollution of either the atmosphere or surface waters. The process involves conversion of sulfides to thiosulfates at elevated temperatures and pressures.

Author's Abstract

Well Practise

Huber, T. A. (assigned to Esso Research and Engineering Co.) METHOD AND MEANS OF COMPLETING A WELL. U. S. 2,749,989 (1956) June 12.

This invention relates to a method and equipment for completing or reworking a well. Principle claim is a tool for extending the effective bottom of previously set tubing to the well bottom or any intermediate point without handling the tubing itself. B. E. Eakin

Tharp, J. M. and Bailey, J. E. PROBLEMS IN COMPLETING HIGH-PRESSURE GAS WELLS. *Petrol. Eng.*, 28, B21-27 (1956) August.

This is a survey article on problems in drilling and completing gas wells with pressures of 10,000 and 15,000 psi at surface. It discusses several field problems, how they are handled, and Tidewater's requirements for such wells as developed after experiences. The main problems lie in safety features, steel goods and connections, corrosion, and temperatures developed upon expansion. E. Kokkelenberg

Well Tools

Bonner, L. F. (assigned to Esso Research and Engineering Co.) METHOD AND APPARATUS FOR FRACTURING A SUBSURFACE FORMATION. U. S. 2,753,940 (1956) July 10.

Fredd, J. V. WELL TOOLS FOR PERFORATING PIPE. U. S. 2,753,935 (1956) July 10.

Gardiner, J. T. (assigned to Lane-Wells Co.) BRIDGING PLUG. U. S. 2,753,942 (1956) July 10.

Hebard, G. G. and Miles, E. S. (assigned to Phillips Petroleum Co.) WELL PACKER AND TUBING HANGER THEREFOR. U. S. 2,753,941 (1956) July 10.

Kammerer, A. W., Jr. (assigned to Rotary Oil Tool Co.) ROTARY EXPANSIBLE DRILL BITS. U. S. 2,754,088 (1956) July 10.

Kammerer, A. W., Jr. (assigned to Rotary Oil Tool Co.) ROTARY EXPANSIBLE DRILL BITS. U. S. 2,754,089 (1956) July 10.

Kammerer, A. W. (assigned to Rotary Oil Tool Co.) STAGE EXPANSIBLE ROTARY DRILL BITS. U. S. 2,765,090 (1956) July 10.

Kucera, C. M. (assigned to Reed Roller Bit Co.) DRILL BIT. U. S. 2,754,091 (1956) July 10.

Morgan, C. K. (assigned to Lane-Wells Co.) CONTROL DEVICE FOR WELL TOOLS. U. S. 2,753,943 (1956) July 10.

O'Leary, P. C. (assigned to Ingersoll-Rand Co.) CLEANSING DEVICE FOR ROTARY ROCK DRILLS. U. S. 2,757,905 (1956) August 7.

Phillips, W. N. (assigned to Gray Tool Co.) PRESSURE ACTUATED SEAL BETWEEN CONCENTRIC PIPES. U. S. 2,754,136 (1956) July 10.

Watts, J. D. and Pierce, E. K. (assigned to Gray Tool Co.) OIL WELL HANGER ASSEMBLY. U. S. 2,754,134 (1956) July 10.

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Capillary Flow

Fatt, I. THE NETWORK MODEL OF POROUS MEDIA. PART I: CAPILLARY PRESSURE CHARACTERISTICS. PART II: DYNAMIC PROPERTIES OF A SINGLE SIZE TUBE NETWORK. PART III: DYNAMIC PROPERTIES OF NETWORKS WITH TUBE RADIUS DISTRIBUTION. *J. Petroleum Tech.*, 8, 144-181 (1956) July.

This series of papers present a new theory of the flow of fluids in porous media. The first paper outlines the theory, and proposes a network of tubes as a more representative model of porous systems than the calculation of capillary pressure curves from network models, and pore size distributions are calculated from these curves. The difference between true and calculated pore size distribution, when calculated from the capillary pressure curve, is demonstrated. The second paper reports on the use of networks of resistors as an analog of the system to determine relative permeability and resistivity index curves for the tube network model. The resulting curves have all of the characteristics of those obtained experimentally on porous media and demonstrate the applicability of the proposed network of tubes model. The third paper presents the relative permeability and relative electrical resistivity curves obtained by a resistor network analog computer for networks of tubes having a tube radius distribution. The resulting curves correspond in detail with those obtained for porous media. The effects of pore size distribution and network structure on relative permeability and electrical resistivity are demonstrated. This tube network model of porous media is a great step forward in defining the actual behavior of fluids flowing through reservoir rock.

B. E. Eakin

Casinghead Recycle

CASINGHEAD GAS BETTER THAN WATER? HUMBLE PLANS NEW RECOVERY METHOD. *Oil Gas J.*, 54, 70-71 (1956) July 16.

Laboratory research has indicated that injection of rich casinghead gas for secondary recovery will result in recovery of about 50% more oil than would be possible by a water injection project for the Bronte, Texas field. The "condensing gas drive" will be highly soluble in the reservoir oil, increasing the oil volume in formation, reducing the fluid viscosity, and improving the permeability relationship.

B. E. Eakin

Computation Problems

Davidson, R. L. HOW COMPUTERS CAN HELP YOU. *Petrol. Processing*, 11, 61-71 (1956) June.

A comprehensive outline of some of the problems to which the petroleum processing industry can apply digital computers. Included are condensations of papers on 1) distillation tower cost estimation, 2) multi-component distillation calculations, 3) how to set up a computer program, 4) the use of computers in natural gasoline operations, and 5) computer for absorber calculations.

B. E. Eakin

Evaporation Loss

Bussard, W. A. EVAPORATION LOSSES AND THEIR CONTROL IN STORAGE. *Petrol. Processing*, 11, 103-26 (1956) July.

This is a special report on the whole subject of

evaporation loss. Topics covered include a review of evaporation types and storage conditions which affect it, and special tanks and equipment which can be used and decrease or eliminate the losses. A special section deals with selection of the process equipment for a given storage problem. W. G. Bair

Gas Turbo-Autos

Eltinge, L. TURBO AUTOS FOR THE FUTURE. *Petrol. Refiner*, 35, 138-44 (1956) July.
Gas turbine designs are presented. A comparison of gas turbines with gasoline reciprocating engines is made on the basis of weight, fuel economy, maintenance, noise level, temperature sensitivity, throttle response, and safety. Applications which may use gas turbines with prominence are portable power and off-highway equipment. Railroad locomotives, and trucks and buses are also discussed. H. A. Dirksen

H_2S Removal

Porter, F. W. and Northcott, R. P. STRIPPING HYDROGEN SULPHIDE FROM HYDROFINED PETROLEUM HYDROCARBONS WITH AN INERT GAS. U. S. 2,757,127 (1956) July 31.
An improved method for removing H_2S from petroleum fractions consists of passing a gas which is essentially free of H_2S, O_2, or oxygen compounds reactive with H_2S, through the petroleum fraction at temperatures generally below 100° C. In the autofining process, for example, the excess hydrogen-containing gases freed of H_2S may be used. In this process not only is the formation of mercaptans by reaction of olefins with H_2S avoided, but the removal of natural inhibitors also is avoided.
D. M. Mason

Production

Davidson, R. D. PANHANDLE GAS WELL FRACTURING PAYS OFF. *World Oil*, 43, 130-134 (1956) August 1.
This article summarizes the increases in productivity obtained for formations in two depth ranges by fracturing treatments. Data are presented on rock properties, treatment and production rates. K. B. Bischoff

Reservoir Engineering

Geertsma, J. Croes, G. A., Schwarz, N. THEORY OF DIMENSIONALLY SCALED MODELS OF PETROLEUM RESERVOIRS. *J Petrol. Tech.*, 8, 118-27 (1956) June.
The derivation is presented of the dimensionless groups which can be utilized to predict the effect of certain variables on the displacement of oil from reservoirs by liquid injection. Three injection fluids are discussed: cold water, hot water, and solvents. The derivations are effected by inspectional and dimensional analysis. The form and physical significance of each group is discussed. The limitations of dimensionally scaled model experiments for studying porous system is also discussed. B. E. Eakin

Woody, L. D., Jr., Moscrip, R. III. PERFORMANCE CALCULATIONS FOR COMBINATION DRIVE RESERVOIRS. *J. Petrol. Tech.*, 8, 128-35 (1956) June.
The calculation procedure described in this article has been used satisfactorily to analyze the past performance and predict the future behavior of combination drive reservoirs producing under both primary and pressure-maintenance operations. To provide a knowledge of the fluid saturation distribution within the reservoir and various stages of production, the displacement equations have been solved simultaneously with the volumetric balance and unsteady-state equations. This technique permits reliable prediction of ultimate oil recovery.
B. E. Eakin

Shale Oil

Cottingham, P. L., Antweiler, J. C., Mayfield, L. G., Keller, R. E., and Coker, W. P. HYDROFINING THERMALLY CRACKED SHALE-OIL NAPHTHA. *Ind. Eng. Chem.*, 48, 1146-51 (1956) July.
Shale oil naphthas were hydrogenated over cobalt molybdate at 400 to 800 psi to eliminate objectionable nitrogen, sulfur and oxygen containing compounds. Instead of the usual 700°-800° F. for this process, the authors studied temperatures in the reforming range of 900° to 1050° F., in order that the loss in olefins would be partly counteracted by formation of aromatics. The effect of temperature was marked; the feed which contained 18 volume percent aromatics was converted at 1001° F. to product containing 35 volume percent aromatics. Saturated content of the feed was 35 volume percent. At 836° F. it was 75 volume percent due to olefin saturation and at 1001° F.

it had decreased to 58 volume percent due to the higher aromatization. E. B. Shultz

Carpenter, H. C., Hopkins, C. B., Kelley, R. E., and Murphy, W. I. METHOD FOR REFINING SHALE OIL. *Ind. Eng. Chem.*, 48, 1139-45 (1956) July.

A refining method, previously used as a basis for economic evaluation of shale oil conversion to gasoline, was carried out in bench scale. Crude shale oil was coked to produce a 700° F. end-point distillate, the heavier portion of which was hydrogenated. Light fractions were reformed and heavy fractions of the hydrogenated product were catalytically cracked. A large amount of data are given for all these processing steps. E. B. Shultz

Pownall, J. R. UNION OIL COMPANY, SHALE OIL PLANT. *Petrol. Eng.*, 28 C50-51 (1956) July.

In addition to research at its Brea, Calif. laboratory on refining and products, Union Oil Co. is proceeding with oil-shale mining development and construction of a 300-ton shale per day retort, near Grand Valley, Colorado. Shale is to be quarried from a 1000-ft face of Mahogany Ledge, primary-crushed and trammed to stockpile, from which it is re-crushed and sent to retort. Crushed shale is piston-charged at the base of a 40-ft shaft, moving upward through hot gas currents to a top discharge. Water is not required in the retorting, but large amounts will be needed for the subsequent refining stages and for domestic use by personnel.

O. P. Brysch

Robinson, W. E., Cummins, J. J., and Stanfield, K. E. CONSTITUTION OF ORGANIC ACIDS PREPARED FROM COLORADO OIL SHALE. *Ind. Eng. Chem.*, 48, 1134-38 (1956) July.

Organic acids from oil shale kerogen were degraded by alkaline potassium permanganate oxidation and converted to n-butyl esters for characterization. Fifty-nine percent of the oxidation product consisted of dicarboxylic acids of the alkane series such as oxalic acid. Forty-one percent consisted of dicarboxylic acids with molecular weights as high as 800. None of the latter could be identified, but appeared to consist of saturated cyclic structures rather than aromatic or paraffinic. The nuclear portion of these higher molecular weight acids seemed to kerogen itself. E. B. Shultz

Thermal Drive

THERMAL RECOVERY GETS A PAYOFF TEST IN CALIFORNIA. *Petroleum Week*, 14-15 (1956) July.

A significant deep test of "in-sites" combustion as a secondary recovery means is being conducted by California Research Corp. in the Midway-Sunset field near Maricopa, Cal. After more than a year of preparation, the oil sand was ignited July 12, and an around-the-clock watch will be kept on the project for at least the next year. Special metering and control equipment has been installed in an attempt to determine the economics of this thermal recovery scheme. B. E. Eakin

7. ANALYTICAL METHODS AND TESTS

Coal Sulfur

Marrison, F. C. and Mott, R. A. THE USE OF BROMINE WATER IN THE DETERMINATION OF SULFUR IN COAL BY THE ESCHKA METHOD. *Chem. and Ind.*, (British), No. 27 715-16, (1956) July 14.

Tests in National Coal Board laboratories on a comprehensive series of British coals of a wide range of sulfur content have shown that the use of bromine water as a final oxidation step is unnecessary. D. M. Mason

Engine Wear

Wilson, J. L. and Sawyer, S. R. MEASUREMENT METHODS FOR WEAR IN PIPE LINE ENGINES AND COMPRESSORS. *Pipe Line News*, 28, 36-40 (1956) July.

The emission spectrograph is used to analyze the lubricating oil of compressor engines for metal contaminates. Tables of typical analysis are given and correlation between engine wear and contamination is discussed. R. R. Amrine

Gas Analysis

Lewis, H. E. andLippold, O. C. J. A METHOD FOR RAPID ANALYSIS OF VERY SMALL GAS SAMPLES. *J. Sci. Instr.* (British), 33, 254-6 (1956) July.

An apparatus is described for the analysis of small samples of gas (0.1-0.001 ml.). A small bubble of the sample is injected into water in

a chamber formed by two horizontal parallel plates. This bubble assumes the shape of a disk, which can be measured, since the volume is then proportional to its cross-sectional area. Convenient methods of optical measurement and recording are described. Analysis is made by the introduction into the chamber of suitable absorbents. Reference is made to some of the uses of this apparatus. Authors' Abstract

HCN Detection

Johnson, J. E. and Poor, E. R. (assigned to United States of America) DEVICE FOR DETECTING HYDROGEN CYANIDE. U.S. 2,753,248 (1956) July 3.

This invention relates to gas detection methods and devices and particularly to detector papers impregnated with materials which will give visible indication of the presence of hydrogen syanide or hydrocyanic acid in the surrounding atmosphere. Inventor's Abstract

Ion Exchange

Arden, T. V. LABORATORY APPLICATIONS OF ION EXCHANGE RESINS. PART V: INDUSTRIAL DEVELOPMENTS. *Lab. Pract.*, 5, 253-55, 258 (1956) July.

Industrial applications of ion-exchange include processes for the recovery of valuable material from relatively valueless solutions, and secondly processes for the removal of contaminating material from valuable solutions. Examples described here include deionization of glycerol and sugar solutions, removal of impurities from anodizing and chromium plating solutions, removal of iron from hydrochloric acid and purification of coke oven effluents. D. M. Mason

Oxygen Method

Smith, R. N., Duffield, J., Piertotti, R. A., and Mooi, J. TER MEULEN MICROMETHOD FOR DIRECT DETERMINATION OF OXYGEN. *Anal. Chem.*, 28, 1161-63 (1956) July.

The ter Meulen method has been adapted to the direct determination of oxygen in organic compounds (sample size ranging from 3 to 10 mg.) and on the surfaces of various carbons containing 0.01 to 4.0% of oxygen (sample size ranging from 50 to 800 mg.). In a series of consecutive determinations, the time required for one determination is 15 minutes.

Authors' Abstract

Oil Additives

Miller, A. THE CHEMISTRY OF LUBRICATING-OIL ADDITIVES. *J. Chem. Educ.* 33, 308-12 (1956) July.

A discussion of the additive agents which can be added to petroleum-base liquid lubricants and of the property of the oil which is improved with each additive. R. R. Amrine

Water in Gas

NEW INSTRUMENT MEASURES WATER VAPOR IN GAS. 183, *Amer. Gas J.*, 14-16 (1956) August.

Mine Safety Appliances Co., Pittsburgh, and Esso Research and Engineering Co. have developed a continuous, automatic method and instrument for recording low concentrations of water vapor in gas streams. It may offer a solution to moisture problems in pipe lines. Principles of operation and design details as well as recording methods and special features are considered. The possibility of new applications is discussed. A flow diagram of the detecting and recording system is included.

J. E. Weise

X-Ray Methods

Reith, A. M. and Weisert, E. D. RAPID CHEMICAL AND ANALYSIS WITH THE X-RAY SPECTROGRAPH. *Metal Progress*, 70, 83-87, July (1956).

Quantitative analysis of cobalt, nickel, and iron-base alloys were made by means of a recording x-ray diffraction unit. A discussion of the methods, some of the problems encountered, and advantages when many samples are to be handled is given. Good accuracy at high concentration is possible. R. R. Amrine

8. GENERAL AND PHYSICAL CHEMISTRY

Diffusion

Call, F. A NEW METHOD OF CALCULATING UNSTEADY STATE DIFFUSION COEFFICIENTS IN POROUS SOLIDS. *J. Appl. Chem.*, 298-300 (1956) July.

Unsteady state diffusion coefficients in porous solids can be calculated by observing the time at which the flux of material through the porous solid is a definite fraction, conveniently one half, of the steady state flux and then substi-

tuting this time into a simple equation. The method requires only a few experimental measurements of the flux. Author's Abstract

Carmichael, L. T. and Sage, B. H. DIFFUSION COEFFICIENTS IN HYDROCARBON SYSTEMS. *Amer. Inst. Chem. Eng. J.*, 2, 273-6 (1956) June.

Because little information is available concerning the behavior of hydrocarbons under conditions far from equilibrium, it appears desirable to obtain data for the diffusion coefficient of the lighter hydrocarbons in the gas phase. The Maxwell diffusion coefficients of n-heptane in the gas phase of the ethane-*n*-heptane and propane-*n*-heptane systems were measured at temperatures from 100° to 220° F. and for pressures up to 60 lb./sq. in. The Fick diffusion coefficient was calculated as a function of state from these measurements. The experimental results indicate that the interfacial resistance between the liquid and the gas phases into which the transport was taking place is small. It was found that pressure exerted a significant influence upon the Maxwell diffusion coefficient for both of the binary systems investigated. There is a marked decrease in the Maxwell diffusion coefficient with an increase in molecular weight of the stagnant component. Authors' Abstract

Gas Viscosities

Jackson, W. M. VISCOSITIES OF THE BINARY GAS MIXTURES, METHANE-CARBON DIOXIDE AND ETHYLENE-ARGON. *J. Phys. Chem.*, 60, 789-91 (1956) June.

The viscosity of 12 mixtures of methane and carbon-dioxide, and 9 mixtures of ethylene and argon, was measured at 25° C. and near atmospheric pressure. A capillary tube viscometer was used for the measurements. The experimental viscosities are compared with viscosities calculated by the Wilke equation, and indicate that the change in viscosity with composition is different for the two gas pairs.

B. E. Eakin

Heat Flow

Brancker, A. V. HEAT FLOW AND SIMULATION. *Petroleum* (British), 19, 244-250 (1956) July.

Analogue computers, extensively used for the solution of heat-flow problems, are based on equations derived from a heat balance. Some of the fundamental principles of heat transfer and conduction leading to these computer methods are reviewed in this paper, together with their application in the petroleum industry.

Author's Abstract

HCN Separation

Asendorf, E. (assigned to Deutsche Gold-und Silber-Scheideanstalt) PROCESS FOR THE SEPARATION OF HYDROCYANIC ACID FROM AMMONIA IN GAS MIXTURES CONTAINING THE SAME. U. S. 2,756,841 (1956) July 31.

According to this invention ammonia can be effectively separated from HCN by subjecting vapor mixtures of these substances to a countercurrent scrubbing with water at temperatures between 60 and 95° C. D. M. Mason

Oxidation

Henley, E. J., Schiffries, W. P., and Barr, N. F. EFFECT OF GAMMA RADIATION ON AQUEOUS ETHYLENE-OXYGEN SOLUTIONS. *Amer. Inst. Chem. Eng. J.* 2, 211-14 (1956) June.

Ethylene and oxygen mixtures dissolved in water at 200 to 700 psi were irradiated with cobalt-60 gamma rays at 180,000 roentgens/hr. Aldehyde yields were very high compared to previous work with saturated hydrocarbons and oxygen. This is apparently due to the high heat content in the ethylene double bond which makes all additions across the bond potential chain reactions. Alcohol, acids and peroxides are also products of this reaction. The authors feel that large-scale industrial use of ionizing radiation will be limited to exothermic reactions in which the radiation initiates long reaction chains.

E. B. Shultz, Jr.

Pressure Energy

Ruth, B. F. and Boylan, D. R. APPLICATION OF BERNOULLI'S EQUATION TO BUOYANT SYSTEMS. *Amer. Inst. Chem. Eng. J.*, 2, 277-9 (1956) June.

The various forms of Bernoulli's equation as customarily written express static pressure energy in terms of absolute pressure, thereby restricting their direct application to systems situated in vacuo. It is shown here that recognition 1) of the universal presence of a fluid outside all systems over which Bernoulli's equa-

tion is written, and 2) of the practical necessity of measuring pressure within such systems as gage pressures relative to the pressure of the exterior fluid leads to a more general set of equations and to a concept of buoyant static pressure and potential energies, as opposed to strictly absolute values. Failure properly to distinguish between these two types of energy quantities may result in error and confusion in the application of the various forms of Bernoulli's equation. Authors' Abstract

Thermal Diffusivity

El-Hifni, M. A. and Chao, B. T. MEASURING THE THERMAL DIFFUSIVITY OF METALS AT ELEVATED TEMPERATURES. *Amer. Soc. Mech. Eng. Trans.*, 78, 813-21 (1956) May.

The Angstrom-bar method has been modified and adapted to the measurement of thermal diffusivity of metals for temperatures ranging from 300° to 1050° F. A small, sinusoidal temperature fluctuation is superimposed on the mean temperature of a thin-wall tubular specimen by means of simultaneous heating and cooling at one end. Thermal diffusivity was calculated from the phase shift and amplitude ratio of the temperature waves determined at two measuring stations. The effect of possible surface heat loss is considered. Measurements were made on AISI 1018, 1045, 3140 steels, and 1.1 per cent carbon tool steel. Results obtained for electrolytic tough-pitch copper and 2S aluminum showed good agreement with a recent theory of Storm concerning the variation of thermal diffusivity of simple metals with temperature. Authors' Abstract

9. ORGANIC CHEMISTRY

Alkylbenzenes

Corson, B. B., Heintzelman, W. J., Odioso, R. C., Tiefenthal, H. E., and Pavlik, F. J. SEPARATION OF POSITIONAL ISOMERIC DIALKYLBENZENES BY ALKYLATION-DEALKYLATION. *Ind. Eng. Chem.*, 48, 1180-2 (1956) July.

There has been considerable interest in pure dialkylbenzenes—e.g., o-, m-, and p-xylenes—as starting materials for the production of resins and plastics. Several methods for seperating dialkylbenzene isomers have been reported. A method based on the relative rates of alkylation permits the production of pure dialkylbenzenes from isomer mixtures. Ferric chloride-catalyzed tert-butylation of 50/50 m-p-xylene gives a 44% yield of raffinate with an o-m-p composition of 0-1-99, plus a 43% yield of alkylate which on dealkylation gives an 84% yield of xylene with an o-m-p composition of 0-98-2. Similar results were obtained with ethyltoluenes and diethylbenzenes. Authors' Abstract

Ammonia from Coal

NEW SYNTHESIS-GAS PROCESS BOLSTERS COAL'S BID FOR CHEMICAL COMEBACK. *Chem. Week*, 78, 76, 78, 80 (1956) June 30.

Olin Mathieson has started up its Morgantown, W. Va. coal partial-oxidation plant, based upon Texaco Development Co's. process for production of CO and H2 for ammonia synthesis gas. Du Pont has operated for the past year its coal-based plant at Belle, making 25 million CF/day. Hydrocarbon Research, Inc. is developing jointly with Philadelphia and Reading Coal and Iron Co., a plant gasifying anthracite. Success of these plants will increase the use of coal and improve the choice of locations for synthesis plants as against those using the natural gas and fuel oil oxidation processes, of which 8 plants are in operation or under construction. Because more oxygen is required, it is probable that coal-based process costs per ton ammonia will fall between the $30 to 37.50 from natural gas or oil, and the $46 from coke (watergas).

O. P. Brysch

Pyrolysis to Ethylene

Pietsch, H. DIE SPALTUNG VON KOHLENWASSERSTOFFEN ZU AETHYLEN. (THE SPLITTING OF HYDROCARBONS TO FORM ETHYLENE. *Erdoel und Kohle* (German), 9, 453-6 (1956) July.

The equilibrium constants for the pyrolysis of ethylene, propane and butane are calculated by assuming the completion of primary reactions. The purpose of this calculation was to get data in order to predict the amount of byproduct that is obtained at different temperatures. The equilibrium constants for the cracking of paraffins and naphthenes to ethylene and cyclication and aromatisation of paraffins to naphthenes have been calculated. The reason that the calcu-

lated equilibrium values have not been realized might be due to the long time of reaction. The olefins formed during the primary reaction are further split to methane or polymerize to aromatics. An increase in pressure shifts the equilibrium to the initial products or side reactions. The heat transfer is an important factor, since it was observed that methods which include heat carrying materials (pebbles, sand) are superior to classical methods. For a maximum ethylene production, a low-heat loss, good heat transfer, short time contact and high temperatures are essential. G. Kunst

10. CHEMICAL ENGINEERING

Absorption Efficiency

Kohl, A. L. PLATE EFFICIENCY WITH CHEMICAL REACTION-ABSORPTION OF CARBON DIOXIDE IN MONOETHANOLAMINE SOLUTIONS. *Amer. Inst. Chem. Eng. J.*, 2, 264-70 (1956) June.

The over-all Murphree gas-phase efficiency is related to K_g (A/V), where A/V is the interfacial area per tray per unit volume of gas and K_g is the overall mass transfer coefficient. With certain simplifying assumptions, a correlation equation has been developed and tested against the available literature data and new data on both high- and low-pressure absorbers.

R. F. Bukacek

Adsorption

Etherington, L. D., Fritz, R. J., Nicholson, E. W., Scheeline, H. W. FLUID CHAR ADSORPTION PROCESS. *Chem. Eng. Progress*, 52, 274-280 (1956) July.

Gas separation by means of counter current solid-gas flow using fluidized char in bubble-cap columns has proved effective in working with C_1 thru C_6 compounds. Details of the pilot plant techniques and equipment used are given. The refinements needed to put the process on a commercial scale are given along with the anticipated applications and special features of the technique which in many ways resembles the old reboiled oil absorber technique.

L. Potempa

Contacting

Vener, R. E. LIQUID-GAS CONTACTING. *Chem. Eng.*, 63, 175-88 (1956) August.

An overall picture of many important operations and the equipment used in them is presented by the author. Voids and uncertainty in theory and practice are pointed out. Subjects discussed include distillation, absorption, humidification, vaporization, heat transfer, gas scrubbing, and others. The article urges much greater interchange of information on experimental research, that duplication of effort may be minimized. J. E. Kennedy

Heat Regeneration

Hasche, R. L. (assigned to Koppers Co., Inc.) SEMI-MAKE AND HEAT REGENERATIVE PROCESS AND APPARATUS. U. S. 2,755,321 (1956) July 17.

The primary object of the invention is to provide a highly efficient and economical cyclic process for the production of various endothermic gas reactions products unit as acetylene, hydrogen and aromatic compounds. In the cyclic process the major portion of the contributed sensible heat to the inlet gas is derived from recovered sensible heat taken from the exit gas and stored in a regenerative mass. The contributed sensible heat may be about equal to the reaction heat carried away so that a substantial heat economy is effected by the recovery and reuse of sensible heat. H. A. Dirksen

Heat Transfer

Johnstone, R. E. THE SCALING-UP TO HEAT TRANSFER COEFFICIENTS. *Inst. Chem. Eng. Trans.* (British) No. 4, 33, 243-51 (1956).

A direct scale-up of pilot plant values is recommended for determining full scale heat transfer coefficients. If the compositions and the mean temperature of the process fluids are the same for the small and large scale, then the effects of physical properties cancel out in the scale-up. For geometrically similar heat transfer surfaces in the pilot plant and full-sized unit, the shape factor also cancels out resulting in a simple power relation between the heat transfer rate, fluid velocity or temperature difference, and scale ratio. Scale relations are derived from standard design equations for forced convection (Dittus-Boelter Equation), natural convection (Lorenz Equation), condensation (Nusselt Equation) and for overall coefficients, and applicability is discussed. Validity of the scale-up

relations was verified experimentally with tests on a model and a full-sized hemispherical steam-jacketed pan. E. J. Pyrcioch

Lassner, H. F. WHY LIMIT RADIANT HEAT INPUT RATES? *Oil Gas J.*, 54, 133-6, 139 (1956) June 11.

In present design of radiant heaters it is customary for the refiner to set a limit on the radiant-heat-input rate. This is done, understandably, to prevent overheating of the coil and possible costly furnace shutdown. Both supplier and user of process heaters would be better off if the stringent limitations on radiant-input rate were omitted from specifications. Some of the major refining companies have, in fact, recently abandoned the practice of prescribing input rates. Instead they limit the tube-wall temperature—which is what was intended originally. This article is aimed at the large group of refinery engineers who are not heater experts but whose duties may involve procurement of process heaters and the necessary writing of specifications for this type of equipment. Earlier literature dealing with radiant flux distribution is reviewed, and the disparity factor is defined. An explanation is given of what the radiant-heat-input limitation means in terms of the Mekler chart which correlates the Stefan-Boltzmann equation. In this manner, a clearer understanding may be obtained by the non-expert of the pros and cons of limiting radiant-heat-input rates. Author's Extract

Packed Columns

Garner, F. H., Ellis, S. R. M., and Granville, W. H. EFFICIENCY OF PACKED COLUMNS FOR EXTRACTIVE DISTILLATION. *J. Inst. Petrol.* (British), 42, 148-54 (1956) May.

In packed columns with the systems methylcyclohexane-toluene and methylcyclohexane-toluene in the presence of furfural, it is found that there is a maximum efficiency or minimum (HETP/Ma) (Gm/Lm) value at an optimum velocity which closely approaches the loading velocity. In the latter system if the packed column is operating below the loading velocity, increasing the solvent concentration does not affect the (HETP/Ma) (Gm/Lm) value. On the other hand, at higher velocities above the loading velocity, increasing the solvent concentration increases the (HETP/Ma) (Gm/Lm) value. Authors' Abstract

Pipe Extrusion

Hitz, G. L. BETTER PIPING AND VESSELS BY COLD EXTRUSIONS. *Oil Gas J.*, 54, 84-87 (1956) July 16.

A description of the cold extrusion process in use by Fluor Products Company for the fabrication of piping assemblies. A number of advantages are claimed. Nozzles ranging from 3 to 16-inch diameter with maximum wall thickness of 1½ inch. R. F. Bukacek

Reactor Design

Corrigan, T. E. and Mills, W. C. CE REFRESHER—CATALYTIC REACTOR DESIGN PROBLEMS—I. *Chem. Eng.*, 63, 201-204 (1956) July.

This article, part of a series on chemical engineering fundamentals, considers how much catalyst and what size reactor are needed for a given production capacity and conversion. A sample problem is worked out in detail for the isothermal case, and results are obtained for both longitudinal and backmixing reactors. E. B. Shultz, Jr.

Tower Packings

Kellyn, N. W. and Swenson, L. K. COMPARATIVE PERFORMANCE OF COOLING TOWER PACKING ARRANGEMENTS. *Chem. Eng. Progress*, 52, 263-68 (1956) July.

The heat transfer and pressure drop characteristics of representative cooling-tower packings from an experimental counterflow unit are reported. Factors influencing the tower characteristic and the air pressure loss are discussed. Simplified expressions for the performance and pressure drop characteristics are presented for beginning correlations covering commercial counterflow and cross-flow high-voidage cooling tower packings. Field tests correlate with experimental results reasonably well. T. Ohren

Tubular Heaters

Mekler, L. A. MECHANICAL DIVISION: II. SELECTING EQUIPMENT D. MECHANICAL DESIGN OF PROCESS TUBULAR HEATERS: PART 3., *Petrol. Eng.*, 28, C26, 28, 30, 32 (1956) June.

Heaters should be designed to handle fuel gases of varying composition and fuel oils of various viscosities and heating values. Stack design for proper draft is included. W. G. Bair

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Humidity Control

Cram, L. A. AN APPARATUS FOR PRODUCING AIR OF CONTROLLED RELATIVE HUMIDITY FOR HYGROMETER CALIBRATION AND TESTING. *J. Sci. Instr.*, (British), 33, 273-6 (1956) July.

Wet and dry air streams are mixed in variable proportions to produce air between 30 and 85% r.h. This humidity is stabilized by automatic control using an electrolytic hygrometer. Calibrations reproducible to better than 0.2% r.h. can be carried out quite quickly.

Author's Abstract

Laboratory Furnace

White, E. S. THE CONSTRUCTION AND OPERATION OF A MOLYBDENUM-WOUND LABORATORY TUBE FURNACE. *Lab. Pract.*, 5, 262-6 (1956) July.

This article describes the construction of a furnace using an impervious alumina tube with limiting temperatures up to 1850° C. or possibly 1950° C. for short periods.

Author's Abstract

Noise Control

Hamme, R. N. ACOUSTICAL MATERIALS. *Machine Design*, 28, 68-74 (1956) July 26.

A review of the engineering factors involved in selecting materials for the four important methods of noise control; sound-transmission attenuation, sound absorption, vibration isolation, and vibration damping.

Author's Abstract

Pressure Gage

Kridner, K. BELLOWS-TYPE ORIFICE METER TESTED FOR GAS MEASUREMENT. *Gas*, 32, 105-9 (1956) July.

Comparison tests of bellows type differential pressure sensing element with the standard mercury manometer type in application to orifice metering indicate that they give comparable results, and that the bellows-type shows very little, if any, drift due to temperature change.

R. F. Bukacek

Pyrometry

Chamberlain, H. H. and Balaban, S. A. (assigned to General Electric Co.) NON-CARBONIZING THERMOCOUPLES. U. S. 2,761,005 (1956) August 28.

A thermocouple protecting tube for use in the jet engine and gas turbine field is described. The inventors claim that a new design eliminates undue carbonization of the insulation and prolongs the life of the thermocouple.

W. G. Bair

Land, T. SUCTION PYROMETRY. *Instr. and Autom.*, 29, 1314-20 (1956) July.

To measure gas temperatures without any error due to radiant heat transfer to or from surrounding walls a suction pyrometer with a system of radiation shields has been developed. The hot gas is sucked past the thermocouple and radiation shields at a high velocity to increase convective heat transfer. The accuracy of the measurement depends on the number of radiation shields used and the gas velocity employed. For good practice, gas velocities should be in the range of 500-700 ft/sec. Suction pyrometers with water-cooled radiation shields have been used successfully in oil-fired open-hearth furnaces. Design details of the Land suction pyrometer as well as other commercially available suction pyrometers are presented.

E. J. Pyrcioch

Soil Corrosivity

Deuber, C. G. and Deuber, G. B. DEVELOPMENT OF THE REDOX PROBE. Amer. Gas Assoc. Res. Project PM-20 (1956) April.

The development and use of a ruggedized field instrument for determining the oxidation reduction potential of soils are discussed. Several illustrations and detailed drawings of the construction of the soil probe utilized in this instrument are included.

G. G. Wilson

Solids Feeder

Eastman, D. E. and Ryan, R. R. (assigned to Allied Chem. & Dye Corp.) CHARGING SOLIDS TO VESSELS. U. S. 2,753,056 (1956) July 3.

This solids feeder for charging material into a reaction vessel provides for an even or predetermined distribution of the solids over the top of the bed of material being treated and for removal of gases during the charging operation. It has application for water gas or producer gas production and coal gasification operation.

E. J. Pyrcioch

12. MATERIALS OF CONSTRUCTION

Cathodic Protection

Doremus, G. L., Mach, W. W. and Lawnick, J. J. APPLICATION OF CATHODIC PROTECTION TO 48 WELL CASINGS AND ASSOCIATED PRODUCTION FACILITIES AT WASKOM FIELD. *Corrosion*, 12, 415t-21 (1956) August.

A description of the design and installation of a cathodic protection system to protect the well casings and field piping of a 48-well gas-field in East Texas. The protection system consists of six selenium rectifiers with graphite anode, ground beds and 206 high potential magnesium anodes. The average current drain per well is 1.5 - 2.0 amperes. G. G. Wilson

Huddleston, W. E. WHICH—RECTIFIERS OR ANODES? *Oil Gas J.*, 54, 283-86 (1956) June 18.

The thesis that present and future conditions of right-of-way generally determine whether rectifiers or sacrificial anodes will provide the most economical cathodic protection of a given pipe line is presented. The phase right-of-way conditions includes the presence or absence of fire and explosion hazards, foreign underground and metallic structures, stray d. c. currents, and existing communication facilities as well as physical topography. G. G. Wilson

Plym, Lm. CATHODIC PROTECTION OF LEAD CABLES IN AN URBAN AREA. *Corrosion*, 12, 331T-35T (1956) July.

An account is given of steps taken in establishing a cathodic protection system for lead-covered telephone cables in an urban area. Practical applications for the following system arrangements are given; distributed ground beds, forced current through a drainage system, distributed negative connections to several underground cables, and duct anodes. The paper includes the steps taken to prevent damage to surrounding underground plants in the installation and use of these systems.

Author's Abstract

Inhibitors

Baxter, R. S., Bennett, H. H., and Hatchett, V. W. CORROSION INHIBITORS IN PETROLEUM PROCESSING EQUIPMENT. Proc. Fourth World Petroleum Cong., Sec. VII, 197-211 (211/C Paper 1) Rome (1955), June.

The causes of corrosion in petroleum processing equipment and the various methods of mitigating corrosion are discussed with emphasis on the organic film-forming inhibitors. The theory of the mechanism of protection by organic inhibitors is reviewed. The advantage and economics of using this type of inhibitor are pointed out and several methods that are utilized in adding the inhibitors are described. The merits of using iron analyses of streams and test coupons are evaluated. Several case histories covering a period of four years are cited in which the inhibitors have been used to control corrosion in various types of petroleum refining equipment. The use of inhibitors for certain applications has permitted the use of carbon steel in place of more expensive alloys or other methods of corrosion control, and has reduced the need for neutralizers. The detergent action of the inhibitors has been beneficial. Cost of using the inhibitors has ranged from $0.30 to $1.50 per 1,000 barrels of unit charge. The inhibitors have increased equipment life, improved unit operation, shortened down-time, and reduced the cost of cleaning and repairs.

Authors' Abstract

Coatings

Liebman, A. J. BLAST CLEANING OF PIPE. *Amer. Gas J.*, 183, 9-13 (1956) August.

Pipe coating characteristics are described as well as the various types of bare metal finishes. Wheelblast, nozzle blast and air blast cleaning systems and equipment are discussed. Economics in air blasting are touched upon. Also included is a chart matching surface pipe condition to average demand on paint characteristics.

J. E. Weise

McClure, A. PIPE LINE COATING PRACTICES. *Pipe Line News*, 28, 41-42, 44-47 (1956) June.

Details of coating practices are discussed, namely coating materials and what is expected from

them; how the coating is done and in what quantities. The varieties of coal tar coatings form another topic since it is the most preferred coating material by most companies. The application costs and various coating problems are also presented. G. Kunst

Parker, M. E. POLYETHYLENE TAPE CATHODIC PROTECTION. *Pipe Line News*, 28, 38 (1956) August.

A summary of the latest results of a long term test of polyethylene tape as compared to conventional coating materials are adjacent sections of the Seadrift Line laid in February, 1954. Tests in March of 1956 indicated that an 8-mile section of pipe coated with an 8-mil polyethylene film had a cathodic protection current requirement per mile only one-third that of an 18-mile section coated with coal tar.
G. G. Wilson

CERAMIC COATINGS ON AIRCRAFT ENGINE COMPONENTS. *Ceramics* (British), 8, 120-1 (1956) July.

One of the more unusual uses of ceramics is the protection from excessive heat of various parts of modern aircraft engines. Author's Abstract

Corrosion

Brundage, H. T. CORROSION—AND 33 YEARS OF SUBMARINE PIPELINING. *Pipe Line Ind.*, 4, 45-47 (1956) May.

A summary of the corrosion experience of the Creole Petroleum Corporation with structures in Lake Maracaibo. Since cathodic protection of all of the pipe in the Lake system is not feasible due to the large mass of bare interconnected pipe present, cathodic protection efforts have been concentrated on hot-spot protection. The effects of marine life in the lake on coatings are discussed briefly.
G. G. Wilson

Hadley, R. F. and Van De Water, D. F. CORROSION OF UNDERGROUND PIPE IN URBAN AREAS. Proc. Fourth World Petroleum Cong., Sec. VII, 245-251 (VII/C Paper 4) Rome (1955). June.

The mitigation of corrosion in urban areas presents problems not encountered in rural areas. The proper use of corrosion control permits decrease in the thickness of pipe wall. Various types of protective coatings are available for use. No evaluation is given, but experience shows there are differences. Cathodic protection should always be used with protective coatings and may be used for protecting bare pipe. Stray currents present a problem, particularly in urban areas, and can be used to protect underground structures. Cooperation between operators of underground structures is of great importance. Authors' Abstract

Kilmer, J. W., Rahmes, M. H., and Lawler, H. L. STANOLIND FIGHTS CORROSION IN THREE SULFUR RECOVERY PLANTS. *Oil Gas J.*, 54, 84-5 (1956) July 9.

The principal cause of corrosion in modern sulfur-recovery plants is solution of corrosive gases in moisture condensed from the process stream. Solution of the problem may take two courses: 1) redesign equipment to minimize contact of the process stream with cool metal surfaces, and 2) external insulation of metal surfaces to prevent moisture condensation.
Authors' Abstract

LaQue, F. L. MANAGEMENT AND CORROSION PROBLEMS. *Chem. Processing*, 19, 8, 9, 50 (1956) July.

The need for more chemical plant managements to recognize the importance of coping with corrosion problems is pointed out. A suggested remedy is the creation of a competent corrosion department with sufficient authority to handle the problem. G. G. Wilson

Hydrogen Attack

Williams, B. G. HYDROGEN ATTACK ON MILD STEEL EQUIPMENT. L. HYDROGEN BLISTERING. *Petroleum* (British), 19, 237-240 (1956) July.

The effect of hydrogen attack on mild steel in the form of blistering is described in this article. The author deals with the mechanism of the blistering itself, the causes of hydrogen transmission, and gives practical advice on the prevention of damage by this means, including equipment and methods of testing.
Author's Abstract

Structural Plastics

STATUS REPORT OF NACE TECHNICAL UNIT COMMITTEE T-1J ON OIL FIELD

STRUCTURAL PLASTICS. *Corrosion*, 12, 69-72 (1956) June.
A summary of the work of this technical committee from October, 1955 through March, 1956. This work included the development of edgewise porosity tests for glass-plastic-pipe and flat laminates, circumferential measurements to determine creep on glass fibre, reinforced polyester and epoxy resin 250-bbl oil-field stock tanks, and high pressure field tests of glass reinforced plastic pipe and tubing.

G. G. Wilson

13. NEW BOOKS

(C. A. Simms, Librarian)

British Fuel Research

Hawthorne, W. R. and Parker, A. REPORT OF THE FUEL RESEARCH BOARD FOR THE YEAR 1955. Dept. Sci. Ind. Research, 69 pp., 4s. Od., HMSO, London (1956) January.
Summaries of progress in research in 1955 are given for a total of 47 separate programs of study grouped under the primary topics of coal constitution, carbonization, gasification, synthetic fuel and chemicals, petroleum fuels, steam boilers, coal turbines, domestic heating, air pollution, information service and extra-mural problems. Recent activities include effect of cobalt radiation on Fischer-Tropsch catalyst, reactive domestic coke from low-rank coals, slagging cyclone gasification, desalting of fuel oil, prevention of sea pollution by oil, and marine smoke elimination. A total of 43 papers published in 1955 by the staff are listed.

O. P. Brysch

Chromatography

Phillips, C. GAS CHROMATOGRAPHY. New York: Academic Press, Inc., 1956.
This book is intended to give a broad survey of the work in the field of gas chromatography. It is especially designed with the object of assisting those who are using, or planning to use gas chromatographic techniques themselves.

Executive Skills

Uris, A. DEVELOPING YOUR EXECUTIVE SKILLS. New York: McGraw-Hill Book Comp., Inc., 1955.
The executive must grow in his job through increasing the skill with which he handles the pattern of personal relationsips and administrative functions connecting him with his organization. This book aims to examine, analyze, and help strengthen the skills the executive needs for peak performance. R. T. Ellington

Flow in Pores

Carman, P. C. FLOW OF GASES THROUGH POROUS MEDIA. New York: Academic Press, Inc., 1956.

The author's object has been to present an integrated and quantitative account of the flow processes involved when gases flow into or through porous media. He approaches it from the viewpoint of the Kozeny theory, and extends to cover the transition to Knudsen flow. Recent work on surface diffusion and capillary flow of adsorbable gases in fine-pored systems is reviewed for the first time.

Kinetics

Smith, J. M. CHEMICAL ENGINEERING KINETICS. New York: McGraw-Hill Book Co., Inc., 1956.

Written at a level suitable for the fourth year of undergraduate work or for the beginning graduate student, this book brings to the engineering students and practicing engineers, the combination of kinetics and reactor design necessary to design, construct and operate reaction equipment. New advances are presented in interpreting catalytic reactions, particularly those occurring on solid catalysts.

Operations Research

McCloskey, J. F. and Trefethen, F. N. OPERATIONS RESEARCH FOR MANAGEMENT. Baltimore: John Hopkins Press (1954).

This book discusses the history and general applications of operations research in part I of three parts. Part II discusses the methods of O. R., including the role of statistics, queuing theory, information theory, linear programming, game theory and the use of computing machines. Part III discusses a number of case histories including applications in commercial operations and agriculture. The text should be useful in acquainting middle management and engineers with the potentiality of this powerful tool. R. T. Ellington

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Gas
Gas Age
Gas and Oil Power
Gas Council (British) Publications
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Gas Journal
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Gas World

Heating, Piping and Air Conditioning

Independent Petroleum Association of America Monthly
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Industrial Finishing
Industrial Gas (American)
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Institute of Fuel (British). Journal
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Journal of Applied Chemistry
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Materials and Methods
Mathematical Aids
Mechanical Engineering
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National Advisory Committee for Aeronautics, Reports
National Fire Protection Association Quarterly
National Gas Bulletin of Australia
National Petroleum News

Official Gazette of the U.S. Patent Office
Oil and Gas Journal

Petroleum
Petroleum Engineer
Petroleum Processing
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Refrigerating Engineering
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